

SUBSPECIALTY PROCEDURES

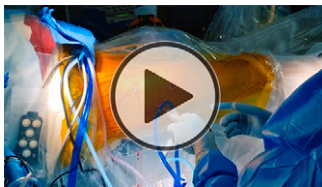
PUNCTURE CAPSULOTOMY TECHNIQUE DURING HIP ARTHROSCOPY

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Investigation performed at Massachusetts General Hospital, Boston, Massachusetts

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Abstract

Background: A number of techniques have been described to enter the capsule and gain access to the hip joint during hip arthroscopy^{1,2}. Among these, the interportal and T-capsulotomies are the most commonly utilized; however, these approaches transect the iliofemoral ligament, which normally resists anterior subluxation and stabilizes extension³. Thus, these approaches may introduce capsuloligamentous instability^{1,4-7} and have been associated with complications such as dislocation, postoperative pain, microinstability, seroma, and heterotopic ossification^{5,8-12}. Although prior literature has demonstrated durable mid-term results for patients undergoing capsulotomies with capsular closure^{6,13}, avoidance of iatrogenic injury to the hip capsule altogether is preferable. Thus, the puncture capsulotomy technique we present is minimally invasive, preserves the biomechanics of the hip joint and capsule without disrupting the iliofemoral ligament, and allows for appropriate visualization of the joint through placement of multiple small portals.

Description: Following induction of anesthesia and with the patient supine on a hip traction table, the nonoperative leg is positioned at 45° abduction with support of a well-padded perineal post, and the operative hip is placed into valgus against the post¹⁴. Intra-articular fluid distention with normal saline solution is utilized to achieve approximately 9 mm of inferior migration of the femoral head and decrease risk of iatrogenic nerve injury¹⁵. Then, under fluoroscopic guidance, an anterolateral portal is created 1 cm anterior and 1 cm superior to the greater trochanter at an approximately 15° to 20° angle. Second, via arthroscopic visualization, the anterior portal is created 1 cm distal and 1 cm lateral to the intersection of a vertical line drawn at the anterior superior iliac spine and a horizontal line at the level of the anterolateral portal. Third, equidistant between the anterior and anterolateral portals, the mid-anterior portal is created distally. Finally, at one-third of the distance between the anterior superior iliac spine and the anterolateral portal, the Dienst portal is created. Thus, these 4 portals form a quadrilateral arrangement through which puncture capsulotomy can be performed⁵.

Disclosure: The Disclosure of Potential Conflicts of Interest forms are provided with the online version of the article (<http://links.lww.com/JBSEST/A448>).

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Alternatives: Alternative approaches to the hip capsule include interportal and T-capsulotomies, with or without capsular closure^{1,2,4,6,7,16}. Although the most frequently utilized, these approaches transect the iliofemoral ligament and thus may introduce capsuloligamentous instability^{1,4-7,17}.

Rationale: The puncture capsulotomy technique has the advantage of maintaining the integrity of the capsule through the placement of 4 small portals. The technique does not transect the iliofemoral ligament and thus does not introduce capsuloligamentous instability. Furthermore, although good mid-term outcomes have been reported with capsular closure^{6,13,18}, the present technique avoids creating unnecessary injury to the capsule and complications of an unrepaired capsule or, conversely, of plication.

Expected Outcomes: Patients who underwent the puncture capsulotomy technique showed significant improvements in multiple functional outcome scores at a mean follow-up of 30.4 months, including the International Hip Outcome Tool (iHOT-33) (39.6 preoperatively to 76.1 postoperatively), Hip Outcome Score-Activities of Daily Living subscale (HOS-ADL) (70.0 to 89.3), HOS Sport-Specific Subscale (HOS-SSS) (41.8 to 75.7), and modified Harris hip score (mHHS) (60.1 to 84.9). At 2 years postoperatively with respect to iHOT-33, 81.0% of patients achieved the minimal clinically important difference, 62.0% achieved the patient acceptable symptom state, and 58.9% achieved substantial clinical benefit. In addition, mean visual analog scale pain scores improved significantly over the follow-up period (6.3 to 2.2; $p < 0.001$). Finally, there were zero occurrences of infection, osteonecrosis of the femoral head, dislocation or instability, or femoral neck fracture in patients treated with puncture capsulotomy^{19,20}.

Important Tips:

- Anterolateral portal placement should be performed using the intra-articular fluid distention technique with fluoroscopy to avoid risk of iatrogenic labral damage and distraction-induced neurapraxia. Subsequent portals must then be placed under direct arthroscopic visualization.
- On establishment of the anterolateral portal, the scope should be switched to the anterior portal to ensure that the anterolateral portal has not been placed through the labrum and to adjust its placement to better access pathology. This portal, as well as all others, may be subsequently modified by adjusting the angle of the cannula, without making a new skin incision.
- If a cam lesion is located more anteromedially or posterolaterally, an additional accessory portal may be made distal or proximal to the anterolateral portal, respectively, in order to enhance visualization.
- Intermittent traction is utilized throughout the surgery. No traction is utilized during preparing and draping, suture tensioning and tie-down, and femoroplasty, with minimal traction during acetabuloplasty; these precautions serve to prevent iatrogenic superficial peroneal nerve injury.
- There can be a steep learning curve for this technique. In particular, greater surgical experience is required to perform adequate femoral osteoplasty for large cam lesions with this approach²¹.
- Instrument maneuverability and visualization can be somewhat constrained with this approach.
- It is more difficult to perform certain procedures with this technique, including segmental and circumferential labral reconstructions, particularly with remote grafts⁵.

Acronyms and Abbreviations:

- iHOT-33 = International Hip Outcome Tool-33
- HOS-ADL = Hip Outcome Score-Activities of Daily Living subscale
- HOS-SSS = Hip Outcome Score—Sport-Specific Subscale
- AP = anteroposterior
- MRA = magnetic resonance arthrogram
- MRI = magnetic resonance imaging

- CT = computed tomography
- ASIS = anterior superior iliac spine
- mHHS = modified Harris hip score

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